

### **REMARKS**

The present invention is a method for analyzing a porous rock sample by measuring a wettability of the porous rock sample in the presence of water and oil. In accordance with the preferred embodiments of the present invention, the method comprises determining a water wet pore surface of the sample  $SM_w$  and an oil wet pore surface of the sample  $SM_o$  when the sample is saturated with water and oil, and calculating a wettability index  $I_{NMR}$  from a combination of the water wet pore surface and the oil wet pore surface obtained. In accordance with the preferred embodiments, the wettability index may be obtained from the relationship

$$I_{NMR} = \frac{SM_w - SM_o}{SM_w + SM_o} \text{ or from the relationship}$$

$I_{NMR} = \log_{10} \frac{SM_w}{SM_o}$  where  $SM_w$  is the water wet pore surface and  $SM_o$  is the wet pore surface when the porous rock sample is saturated with water and oil.

The invention has applications for hydrocarbon engineering or development, civil engineering, determining pollution of formations and testing of building materials in order to determine water proofing treatments. See the Abstract and paragraphs [0013] and [0015] of the Substitute Specification.

Claims 21-41 stand rejected under 35 U.S.C. §101 as being non-statutory subject matter. The Examiner reasons as follows:

The claimed invention is directed to a judicial exception to 35 U.S.C. 101 (i.e., an abstract idea) and is not directed to a practical application of such judicial exception (e.g., because the claim does not require any physical transformation and the invention as claimed does not produce a useful, concrete, and tangible result). The language in the claim suggest only a combination of instructions without reciting a

structure associated to the procedure and lacks a tangible result and the end of the procedure.

The rejection is traversed for the following reasons.

Claim 21 has been amended to recite "a method for analyzing a porous rock sample by measuring a wettability of the porous rock sample in the presence of oil and water, comprising determining a water wet pore surface of the sample and an oil wet pore surface of the sample when the sample is saturated with water and oil, and calculating a wettability index from a combination of the water wet pore surface and the oil wet pore surface. As pointed out above, the analysis of a porous rock sample has numerous applications in the physical world which are set forth in the Abstract and paragraphs [0013] and [0015] of the Substitute Specification. Contrary to the Examiner's assertion, the claims, by reciting a method for analyzing a porous rock sample defined by determining the water wet pore surface and oil wet pore surface and calculating a wettability index, do pertain to a useful process, is concrete by involving the analysis of a porous rock sample and finally produces a tangible result which is the calculation of the wettability index which is a known useful parameter in the field of petroleum engineering from a combination of the water wet pore surface and the oil wet pore surface.

The wettability index is described in the Substitute Specification in paragraph [0034] and is defined by, for example, the calculation of Equation 1a and Equation 1b. Moreover, the quantities in the Equations 1a and 1b are obtained by means of, for example, the generalized relationship of Equation 2 as set forth in paragraph [0036] through paragraph [0040]. The specific relationship of equations 3 and 4 respectively for water and oil are derived from Equation 2. Moreover, the Examiner is referred to paragraphs [0045] through [0048] identified by the heading

"Implementation" including paragraph [0046] identified by the heading "Practical implementation example".

It is therefore seen that the claimed wettability index is a physical parameter describing a characteristic of an analyzed porous rock sample which has utility for numerous applications as exemplified in the specification and as identified above. The Examiner should consider the wettability index as a physical parameter much like the octane rating of gasoline which is, contrary to the Examiner's assertion, useful, concrete and moreover, has a tangible result in real world applications as set forth in the specification.

The recitation that the method is for analyzing a porous rock sample is an application of the present invention in the physical world. A rock sample is a physical thing which is useful, concrete and has tangible attributes which qualify as statutory subject matter. A wettability index obtained from a combination of the water wet pore surface and the oil wet pore surface defines a useful physical world quantity having numerous applications which satisfies all the criteria for determining statutory subject matter.

Claims 21-23 and 30 stand rejected under 35 U.S.C. §102 as being anticipated by United States Patent 5,162,733 (Baldwin). It is noted that the Examiner has essentially repeated the same grounds of rejection as in the previous Office Action.

Moreover, in the "Response to Arguments", the Examiner states as follows:

Applicant argues that Baldwin fails to teach or fairly suggest the step of calculating the wettability index from a combination of the water wet pore surface and the oil wet pore surface.

The examiner disagrees with applicant's argument because Baldwin discloses the step wherein the oil wet pore surface

represented by equation #6 (Column 8, lines 20-24) and the water wet pore surface represented by equation #9 (Column 8, lines 66-67) are combined to calculate the wettability index of the rock (Column 9, lines 10-30).

The Examiner's assertion that Baldwin teaches a wettability index obtained from a combination of water wet pore surface and oil wet pore surface by reliance on Equations 6 and 9 is erroneous for the following reasons.

Baldwin teaches the obtaining of an NMR parameter value for saturated core plugs in Section 3 of his disclosure including in column 6 where it is taught "[f]or certain calculations discussed further below, it is necessary to determine the saturation level of the core plug with respect to oil in its desaturated state hereinafter referred to as R(1). R(1) can be expressed as a fraction or percentage." Column 6 further teaches that R(1) can be determined by any suitable technique including a technique employing measured weights of the core plug. As may be noted, Equation 6 is a function of R(1) which is described in association with obtaining of a NMR parameter value for a flooded core plug in Section 7 of Baldwin beginning in column 7. Furthermore, Equation 9 is seen to be a function of R(2) which appears to be the corresponding parameter to define the saturation level of the plug with respect to water. As may be seen, Section 9 of Baldwin in column 8 teaches repeating steps 2-7 with respect to water as a saturating liquid and oil as a flooding liquid and which concludes with equation 9.

It is submitted that a person of ordinary skill in the art, contrary to the Examiner's assertion, would not consider Equations 6 and 9 to be the claimed "water wet pore surface" and "oil wet pore surface". The interpretation of Equations 6 and 9 as set forth by the Examiner in the Response to Arguments" does not demonstrate that equations 6 and 9 correspond to the claimed oil and water pore surfaces.

The Examiner has arbitrarily concluded Equations 6 and 9 respectively teach an oil wet pore surface and a water wet pore surface without demonstrating that a person of ordinary skill in the art would consider the disclosure of Baldwin to suggest these claimed quantities when the claimed oil and water wet pore surfaces are given their broadest reasonable construction read in light of Applicants' specification. Accordingly, it is submitted that the Examiner has not laid out a *prima facie* case for anticipation.

Moreover, it is noted that the Examiner refers to the Abstract, columns 2 and 9, respectively, in lines 47-60 and 10-30 for the teaching of "calculating a wettability index from a combination of the water wet pore surface and the oil wet pore surface". It is further noted that the Examiner does not supply any response to arguments with respect to the calculation of a wettability from a combination of the water wet pore surface and the oil wet pore surface recited claim 21. If the Examiner persists in the stated grounds of rejection, it is requested that he point out where in the Abstract, column 2, lines 47-60, or column 9, lines 10-30, "calculating a wettability index from a combination of the water wet pore surface and the oil wet pore surface" is met in view of the above comments regarding Equations 6 and 9 of Baldwin not teaching an oil wet pore surface and a water wet pore surface.

The specification has been amended to improve its form for reexamination.

Moreover, Applicants will submit a drawing amendment to correct certain French language recitations which are contained in Figs. 2A, 3A and Fig. 5.

New claims 42-44 have been added to claim disclosed applications of the method for analyzing a porous rock sample as set forth in independent claim 21.

These claims are supported by the previous references to the specification regarding applications of the claimed invention.

In view of the foregoing amendments and remarks, it is submitted that each of the claims in the application is in condition for allowance. Accordingly, early allowance thereof is respectfully requested.

To the extent necessary, Applicants petition for an extension of time under 37 C.F.R. §1.136. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account No. 01-2135 (612.44794X00) and please credit any excess fees to such Deposit Account.

Respectfully submitted,

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Attachments

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